

Remarks

Claims 1, 3-41, and 43-106 are pending in the application. Claims 2 and 42 were canceled in a previous amendment A. Claims 20, 21, 23, 24, 28, 31, 39, 61, 62, 64, 65, 69, 72, 80, 83, 105, and 106 have been amended. No new matter has been added by virtue of this amendment. Reconsideration of the application as amended is requested.

Entry of this Amendment After Final

Applicant has amended claims 21, 23, 24, 28, 31, 39, 62, 64, 65, 69, 72, 80, 105, and 106 to add structure to overcome the claim objections identified by the Examiner. Similarly, Applicant has also amended claims 20 and 61 to make explicit that the feedback mechanism is activated under a processor program. Applicant also amended claim 83 as required by the Examiner. Applicant requests entry of the present amendment after final since the claims are now in condition for allowance and since the amendment to these dependent claims satisfies the objection and does not provide additional matters for consideration or searching.

Claim Objections

The Examiner objects to claims 21, 23, 24, 28, 31, 39, 62, 64, 65, 69, 72, 80, 105, and 106 under 37 CFR 1.75a as being of improper dependent form for not providing structure which further limits the apparatus. Applicant has amended these claims to add the apparatus. The Examiner also objected to claim 83, and applicant has amended claim 83 according to the request of the Examiner. Applicant has similarly added apparatus and program to claims 20 and 61. Thus, the claim objections have been overcome.

Claim Rejections—35 U.S.C. § 102(b)

The Examiner rejects claims 1, 3-6, 8-11, 13-15, 17-19, 25-32, 39-46, 48-52, 54-56, 58-60, 66-73, 80-85, 88-94, 96, 97, 99-102, 105, and 106 under 35 U.S.C. § 102(b), as being anticipated by Hansen (5,744,953). Claim 1 provides:

1. A device for attaching to a living subject having a joint, comprising a first sensor, a second sensor, a processor, and a non-volatile storage device, said first sensor for attaching to a first body segment above the joint, said second sensor for attaching to a second body segment below the joint, wherein said first sensor and said second sensor each comprise a solid state inclination measuring device for determining **inclination with respect to the gravity vector**, wherein said **inclination with respect to the gravity vector** determined from said first sensor

and from said second sensor is processed in said processor and stored in said non-volatile storage device for distinguishing lying, sitting, and standing positions, wherein said processor and said non-volatile storage device are part of the device for attaching to the living subject.

As described in claim 1, the first sensor and the second sensor each comprise a solid state inclination measuring device for determining inclination with respect to the gravity vector. In claim 1, the inclinations with respect to the gravity vector measured by the two sensors is processed in the processor and stored in the non-volatile storage device for distinguishing lying, sitting, and standing positions. Hansen does not mention the gravity vector. Instead Hansen teaches providing a transmitter having three coils for providing magnetic fields separately along each of three orthogonal axes "that can be received by the mutually orthogonal coils of each sensor." In that way Hansen provides an alternative scheme that uses magnetic field sensors. There is no teaching or suggestion in Hansen to measure inclination with respect to gravity which only points along one possible axis anyway.

In the operation of the embodiment of FIG. 1, under the control of the microcomputer 55 (see FIGS. 13 and 14) inside the electrical box 17, the **X-direction coil of the transmitter 23 is first activated and signals received at all of the mutually orthogonal coils of each sensor 25 are measured and stored in the microcomputer 55.** Thereafter, under the direction of the microcomputer 55, the **Y-direction coil of the transmitter 23 is activated and signals received by each of the mutually orthogonal coils of the sensors 25 are measured and stored.** The system, under the direction of the microcomputer 55, then activates the **Z-direction coil of the transmitter 23 and signals received by the mutually orthogonal coils of the sensors 25 are measured and stored by the microcomputer 55.** The microcomputer 55 is programmed with an algorithm such as that which is employed in U.S. Pat. Nos. 4,849,692 and 4,945,305 to Blood, to find the position and orientation of each sensor 25 in six degrees of freedom with respect to the transmitter 23 and sent to the host computer 21. Thus, motions of the user 1, **relative to the transmitter 23,** may be measured and subsequently recreated.

Hansen's system gives "the motions of the user 1 relative to the transmitter 23." There is no teaching or suggestion in Hansen to measure inclination with respect to the gravity vector of the earth.

Furthermore, Hansen does not teach or suggest that the inclination data is "processed in said processor and stored in said non-volatile storage device for distinguishing lying, sitting, and standing positions." Hansen does not teach or suggest any way of distinguishing lying, sitting, and standing positions. Thus, the rejection of

claim 1, and claims dependent thereon, under 35 U.S.C. § 102(b), as being anticipated by Hansen has been traversed.

In addition, claim 1 provides "said first sensor for attaching to a first body segment above the joint, said second sensor for attaching to a second body segment below the joint, wherein said first sensor and said second sensor each comprise a solid state inclination measuring device for determining inclination with respect to the gravity vector" Claim 3 provides that the inclination measuring device comprises a dc accelerometer. Thus, in claim 3, each of the two sensors includes a dc accelerometer. One of the dc accelerometers is above a joint and one is below the joint. Hansen only provides his dc accelerometers on each foot along with pressure sensitive switches. With his dc accelerometers on different feet, Hansen does not provide one above a joint and one below the joint. Thus, although Hansen provides magnetic field sensors in various places on the body there is no teaching or suggestion in Hansen to provide a dc accelerometer above a joint and a dc accelerometer below the joint, as provided in claim 3. Thus, the rejection of claim 3 under 35 U.S.C. § 102(b), as being anticipated by Hansen has been traversed. Similar arguments apply to other dependent claims rejected by the Examiner.

Claim 40 provides:

40. A device comprising a solid state sensor, a processor, a non-volatile storage device, and a **feedback mechanism** wherein data from said sensor is processed in said processor to provide an output, wherein said output is stored in said non-volatile storage device as a function of time, and **wherein multiple points of said time dependent output stored in said non-volatile storage device are processed in said processor, wherein said processor is programmed to direct said feedback mechanism to provide information or instruction in response to said multiple points of time dependent output indicating inactivity, or activity of a joint during an interval of time that is less than a preset level of activity, or a range of motion of a joint during an interval of time that is less than a preset range of motion or vibration during an interval of time that is greater than a preset amount of vibration.**

Applicant would respectfully ask the Examiner to consider that Hansen does not teach or suggest a **feedback mechanism**. Nor does Hansen teach or suggest a feedback mechanism in which "said processor is programmed to direct said **feedback mechanism to provide information or instruction in response to said multiple points of time dependent output indicating inactivity, or activity of a joint during an interval of time that is less than a preset level of activity, or a range of motion of a joint during an interval of time that is less than a preset range of motion or vibration during an interval of time that is greater than a preset amount of vibration.**" The systems Hansen

describes in column 5, lines 8-34 and in column 9, line 45 to column 10, line 14 is the measuring system itself that uses a signal from a transmitter. But a feedback mechanism, as described in claim 40 is a mechanism that provides "information or instruction in response to . . . output" of the sensors and the processor. Hansen provides no such teaching or suggestion. Thus, the rejection of claim 40, and claims dependent thereon, under 35 U.S.C. § 102(b), as being anticipated by Hansen has been traversed.

Claim 83 provides:

83. A device for attaching to a living subject, comprising a first sensor, a processor, and a storage device, wherein said **first sensor comprises a device for determining a curvature of a spine** of the living subject, wherein data from said first sensor is processed in said processor and stored in said storage device, wherein said first sensor, said processor and said storage device are part of the device for attaching to the living subject.

Applicant would respectfully ask the Examiner to consider that Hansen does not teach or suggest a **sensor that includes "a device for determining a curvature of a spine."** No mention of curvature or spine is made in the entire Hansen patent. Nothing in FIGS. 1-3 or Column 5, lines 1-59 teaches or suggests a device for determining curvature of a spine. Hansen does not teach or suggest including such a sensor as one of the sensors he mounts. Nor does he teach or suggest positioning any kind of sensor to detect curvature of the spine. Thus, the rejection of claim 83, and claims dependent thereon, under 35 U.S.C. § 102(b), as being anticipated by Hansen has been traversed.

Claim 99 provides:

99. A device comprising a first sensor for placing on a first body segment, a second sensor for placing on a second body segment, a processor, a storage device, and a **feedback mechanism** wherein data from said first and said second sensors is processed in said processor to provide an output, wherein said output is stored in said storage device as a function of time, and wherein multiple points of said time dependent output stored in said storage device are processed in said processor, wherein **said processor is programmed to direct said feedback mechanism to provide information or instruction in response to said multiple points of time dependent output.**

Applicant would respectfully ask the Examiner to consider that Hansen does not teach or suggest a **feedback mechanism**. Nor does Hansen teach or suggest a feedback mechanism in which "said processor is programmed to direct said **feedback mechanism**

to provide information or instruction in response to said multiple points of time dependent output." The systems Hansen describes in column 5, lines 8-34 and in column 9, line 45 to column 10, line 14 is the measuring system itself that uses a signal from a transmitter. But a feedback mechanism, as described in claim 40 is a mechanism that provides "information or instruction in response to . . . output" of the sensors and the processor. Hansen provides no such teaching or suggestion. Thus, the rejection of claim 99, and claims dependent thereon, under 35 U.S.C. § 102(b), as being anticipated by Hansen has been traversed.

Claim Rejections--35 U.S.C. § 103(a)

The Examiner rejects claims 7 and 47 under 35 U.S.C. § 103(a), as being unpatentable over Hansen. The Examiner states that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the transmitter of Hansen to produce a magnetic field which would simulate the earth's magnetic field, since the transmitter can produce a range of magnetic fields and so that the data gathered will mirror data that would be recorded in non-laboratory areas (col. 9, lines 54-57).

However, the earth's magnetic field extends along three axes, and applicant would respectfully ask the Examiner to consider that Hansen teaches against such an approach that would provide magnetic field along all three axes simultaneously. Hansen provides for sequentially providing a magnetic field along each orthogonal axis, as described in column 5, lines 7-20 (quoted above on page 18). As described in column 9, lines 54, 57, Hansen's system "can employ any desired magnetic field position and orientation measurement system and, if desired can utilize either AC or DC magnetic fields." Thus, Hansen does not his system of providing magnetic fields along each axis sequentially. He merely provides for any measurement system to be used to detect the magnetic fields so produced. He also provides that the transmitter can transmit AC or DC, but there is no teaching or suggestion that the fields produced are along all three axes at once as would be the case for the earth's magnetic field in almost all locations on the earth.

The Examiner rejects claims 12 and 53 under 35 U.S.C. § 103(a), as being unpatentable over Hansen. However, as described herein above under the remarks for the 102 rejections of claim 1 and claim 40, Hansen does not teach or suggest the inclination with respect to the gravity vector limit in claim 1, from which claim 12 depends, and the feedback mechanism of claim 40, from which claim 53 depends.

The Examiner rejects claims 16, 20, 21, 23, 24, 33-38, 57, 61, 62, 64, 65, 74-79, 86, 87, 95, 98, 103, and 104 under 35 U.S.C. § 103(a), as being unpatentable over Hansen in view of Hutchings.

As to claims 16, 20, 21, 23, 24, 33-38, which depend on claim 1, Hansen is silent

about using gravity. As described herein above, Hansen does not measure inclination with respect to gravity. Hutchings teaches against using the gravity vector: Hutchings provides a way to "keep track of the contribution of gravity to the accelerometers and remove it from measurements" (column 10, lines 37-46).

Hutchings has display 18 with radio receiver 14 on the wrist and measuring system 10 on the foot. Hutchings' device is for displaying distance a runner has traveled, speed, and height. Hutchings teaches using only one sensor or measuring system. Regardless of where placed, Hutchings has only one measuring system on the person's body and the sensor or measuring system is only in one location in Hutchings. (If there is a sensor and a separate wrist unit, the wrist unit is only a display). There is no teaching or suggestion in Hutchings to provide sensors on different body segments across a joint, as provided in claim 1.

Furthermore, in view of Hutchins only using one measurement system while Hansen mounts measurement systems in several places, further invention would be required to combine the two contradictory systems. Hindsight from the present invention would be required to achieve the combination of claim 1 that uses one above and one below a joint.

In addition, Hutchings does not teach or suggest measuring inclination, as provided in claim 1—his sensor on wrist 190 of a swimmer is a position, velocity, and acceleration measuring device, but there is no teaching or suggestion that it is a device for measuring inclination with respect to gravity.

Because he only has one sensor and because Hutchings does not teach or suggest measuring inclination, Hutchings cannot determine posture, including distinguishing lying sitting, and standing positions.

Thus, the references, individually and in combination do not teach or suggest the limits of claim 1, and claims dependent thereon, concerning "determining **inclination with respect to the gravity vector**, wherein said **inclination with respect to the gravity vector** determined from said first sensor and from said second sensor is processed in said processor and stored in said non-volatile storage device for distinguishing lying, sitting, and standing positions, wherein said processor and said non-volatile storage device are part of the device for attaching to the living subject."

As to claims 57, 61, 62, 64, 65, 74-79, which depend on claim 40, Hansen is silent about feedback. Hutchings provides feedback concerning the speed of the runner, the distance traversed and the height jumped. In addition, Hutchings states, "in the watch mode, microprocessor 64 selectively provides to display 68, normal watch functions such as time of day, date, an alarm signal when a preselected time occurs" (column 25, lines 14-16). While Hutchings has a display and provides feedback to the runner about his

distance, speed, and height, Hutchings does not teach or suggest apparatus or programming necessary to provide feedback for inactivity or too small a level of activity of a joint, too small a range of motion of a joint or too much vibration during an interval of time, as provided in claim 40. Hutchings' device 18 is merely for displaying distance traveled, speed, and height, as well as information available from normal watch functions. Further invention would be required to provide apparatus and programming to accomplish the idea of claim 40 to provide feedback concerning inactivity or too small a level of activity or too much vibration. Nothing in Hansen or Hutchings suggests the idea or the desirability of such apparatus or programming or such additional invention. Thus, the rejection of claims 57, 61, 62, 64, 65, 74-79 as being unpatentable over Hansen in view of Hutchings under 35 U.S.C. § 103(a), has been traversed.

As to claims 86, 87, 95, 98, which depend on claim 83, both Hansen and Hutchings are silent about "a device for determining a curvature of the spine," as described in claim 83 from which these claims depend. Nor does Hansen or Hutchings teach or suggest the more detailed limits concerning the determination of the curvature of the spine provided in dependent claims 86, 87, 95, and 98. For example, neither Hansen nor Hutchings individually nor in combination, teach or suggest a processor having a program to measure time in a position, determine whether the time exceeds a preset value, and prompt the subject to move if so, as described in claims 86, 95, and 98. Nor does either reference suggest a pair of inclination measuring devices for measuring inclination with respect to gravity, as described in claim 87.

Regarding claims 20, 61, 86, 87, 95, 98, 103, and 104, the Examiner states that "Hansen and Hutchings disclose a device which monitors movements, etc over time periods and also suggest using such data for analysis. (Hansen, col. 5, line 34-col. 6 line 67 and col 9, line 45-col 10, line 14; Hutchings, col 25, line 39-col 26, line 44). The Examiner further states that "programming the feedback device, which already includes a display of the data to further indicate activity or inactivity over a period of time, or exceeding limitations a set number of times, is intended use of the programs which could be capable of performing such functions. Furthermore it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations." However, claim 20 includes structural elements itself and in independent claim 1 from which it depends. As described herein above, neither reference teaches or suggests "a device for determining inclination with respect to the gravity vector" and processing such inclination from two such devices, one above and one below a joint. Absent this structural element, neither Hansen nor Hutchings can provide the feedback mechanism and function provided in claim 20.

With respect to claim 61, while Hutchings has a display and provides feedback to the runner about his distance, speed, and height, as well as normal watch functions,

Hutchings does not teach or suggest apparatus or programming necessary to provide feedback for inactivity or too small a level of activity of a joint, too small a range of motion of a joint or too much vibration during an interval of time, as provided in claim 40, from which claim 61 depends. Further invention would be required to provide apparatus and programming to accomplish the idea of claim 40 to provide this additional feedback. Nothing in Hansen or Hutchings suggests the idea or the desirability of such apparatus or programming or such additional invention.

With respect to claims 86, 87, and 98, both Hansen and Hutchings are silent about "a device for determining a curvature of the spine," as described in claim 83 from which these claims depend. Nor do Hansen or Hutchings teach or suggest a processor having a program to measure time in a position, determine whether the time exceeds a preset value, and prompt the subject to move if so, as described in claims 86 and 98. Nor does either reference suggest a pair of inclination measuring devices for measuring inclination with respect to gravity, as described in claim 87.

Claims 103 and 104, depend on claim 99. Hansen provides multiple sensors but Hutchings only has a single sensor on a single body segment. There is no teaching or suggestion of providing additional sensors in Hutchings, and doing so would increase the cost of his system without contributing to the purpose of Hutchings to determine position, speed, and height of a runner. In combining Hutchings with Hansen there is no teaching or suggestion as to how to combine the contradictory references with regard to the number of sensors or their positioning on body segments. Nor is there reason to do so since Hansen can achieve his purpose of tracking motion without any contribution from Hutchings. Even if the combination is made further invention would be needed to achieve the invention described in claim 99 with its provision that **"data from said first and said second sensors is processed in said processor to provide an output, wherein said output is stored in said storage device as a function of time, and wherein multiple points of said time dependent output stored in said storage device are processed in said processor, wherein said processor is programmed to direct said feedback mechanism to provide information or instruction in response to said multiple points of time dependent output."** Hansen does not provide feedback, and nothing in Hutchings teaches or suggests combining data from two sensors to provide an output that is ultimately used to direct feedback. Only by hindsight from the present invention would one hope to achieve the combination provided in claim 99. Therefore the rejection of claim 99, and claims dependent thereon, including claims 103 and 104, as being unpatentable over Hansen in view of Hutchings under 35 U.S.C. § 103(a), has been traversed.

The Examiner also rejects claims 22 and 63, under 35 U.S.C. § 103(a), as being unpatentable over Hansen and Hutchings as applied to claims 1, 3-41, 43-106 above, and further in view of Brann.

The Examiner acknowledges that the limits in claims 22 and 63 are not disclosed in either Hansen or Hutchings. However, the Examiner states that they are disclosed by Brann. However, applicant would respectfully ask the Examiner to consider that neither Brann nor Hutchings nor Hansen, individually or in combination, teach or suggest the limits of claim 1 to measure inclination with respect to gravity, and therefore the rejection of claim 22, dependent on claim 1 has been traversed. Similarly, none of the references, either individually or in combination teach or suggest the limits of claim 40, to provide feedback "wherein said processor is programmed to direct said feedback mechanism to provide information or instruction in response to said **multiple points of time dependent output indicating inactivity**, or activity of a joint during an interval of time that is **less than a preset level of activity**, or a range of motion of a joint during an interval of time that is **less than a preset range of motion**, or vibration during an interval of time that is **greater than a preset amount of vibration**." Therefore the rejection of claim 63 has been traversed.

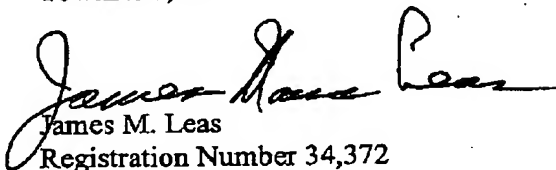
Applicant has reviewed the prior art made of record and not relied upon and believes that the Fulton patent is no more relevant than the prior art relied upon by the Examiner.

It is believed that the claims are in condition for allowance. Therefore, applicant respectfully requests favorable reconsideration. If there are any questions please call applicant's attorney at 802 864-1575.

Respectfully submitted,

For: Townsend, et al.

By:


James M. Leas

Registration Number 34,372

Tel: (802) 864-1575

James M. Leas
37 Butler Drive
S. Burlington, Vermont 05403